

Wood Turtle (*Glyptemys insculpta*) Species Guidance

Previously known as *Clemmys insculpta*

Family: Emydidae – the pond turtles

State Status: [Threatened](#) (1975)

State Rank: [S2](#)

Federal Status: [None](#)

Global Rank: [G4](#)

Wildlife Action Plan

Mean Risk Score: [4.1](#)

Wildlife Action Plan Area

Importance Score: [3](#)



Counties with documented locations of wood turtle in Wisconsin. Source: Natural Heritage Inventory Database, August 2012.



Photo by A.B. Sheldon

Species Information

General Description: The wood turtle is a medium-sized turtle, with a 12-24 cm-long (4.7-9.4 in) carapace (upper shell) (Vogt 1981). The plastron (lower shell) is typically yellow with large black blotches on the lateral edge of each ventral scute (segment). The top of the head and distal (rear) portions of the legs are dark brown, gray, or black. The skin between the scales, in the leg sockets, and on the throat is usually yellow, or occasionally orange. The individual scutes of the carapace possess growth annuli (rings that form concentric circles) that are far more pronounced than on any other Wisconsin turtle. Individuals may vary in these characteristics, and some may differ slightly from this general description.

Similar Species: The Blanding's turtle (*Emydoidea blandingii*) is the only species in Wisconsin that may be mistaken for the wood turtle. Both species have yellow plastrons with black marks on individual scutes and some degree of yellow coloration around the neck. The Blanding's turtle is distinguished by a much brighter yellow that covers the entire lower jaw, whereas the wood turtle lacks the bright yellow chin. Young Blanding's turtles will often have visible growth annuli, but they are much less pronounced than those of the wood turtles. Juvenile and adult Blanding's turtles have a hinged plastron and adults have a smooth, highly domed carapace.

Associated Species: In Wisconsin, the wood turtle may occur in the same water bodies as all other riverine turtle species where their geographic distributions overlap. Snapping turtles (*Chelydra serpentina*) are the most commonly associated turtle species in Wisconsin because of their extensive state distribution.

State Distribution and Abundance: Wood turtles are found from the northern parts of Wisconsin down to Brown, Outagamie, and Winnebago counties, and south to the extreme southwest counties, but are absent from Polk, Pepin, Richland, Waushara, Marquette, and Green Lake counties. Distribution information for this species may not reflect its full extent in Wisconsin because many areas of the state have not been thoroughly surveyed.

Global Distribution and Abundance: The wood turtle occurs in the Midwest in Wisconsin and Michigan, as well as small portions of Minnesota and Iowa. To the east, they are found from the northern tip of Virginia through Maine. They also occur in the Canadian provinces of Ontario, Quebec, New Brunswick and Nova Scotia (Harding 1997).

Diet: Wood turtles are opportunistic feeders with omnivorous tendencies (Harding and Bloomer 1979, Farrell and Graham 1991, Walde et al. 2003). They have been observed eating a wide variety of plant material ranging from various berries and leaves to mushrooms. Wood turtles also eat numerous invertebrates, such as earthworms, insects and mollusks, and vertebrates such as young mice, amphibians and carrion (Harding and Bloomer 1979, Walde et al. 2003).

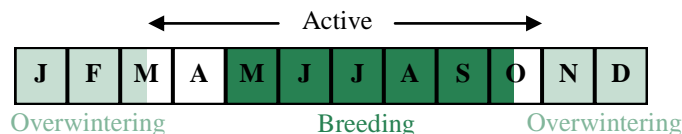
Reproductive Cycle: Mating occurs at various points throughout the active season and has been observed from May until November, but the majority of mating occurs in the fall (Walde et al. 2003). Mating most often takes place from midday to late afternoon and in water at depths of 0.1-1.2 m (0.3-3.9 ft); terrestrial mating has been observed (Ernst 1986, Walde et al. 2003). Females nest from May 20-July 5, with peak nesting activity in mid- to late-June, and select nesting sites that generally consist of sandy river/stream banks or sandbars (Walde et al. 2007, Vogt 1981). Wood turtles also nest in disturbed habitats such as roadsides, agricultural fields, and gravel pits (Thayer et al. 2008). Female wood turtles will "stage" (remain within the vicinity) near nesting areas for several days before they deposit their eggs; staging areas typically possess unaltered natural vegetation such as alder thickets (Walde et al. 2007). Nest-site fidelity has been observed in this species (Walde et al. 2007). In Wisconsin, females lay one clutch per year and some individuals only nest every other year (Ross et al. 1991). Clutch sizes may vary depending on geographic location; a mean of 11 eggs per clutch has

been observed in a Wisconsin population (Ross et al. 1991). Walde et al. (2007) reports incubation times for deposited eggs of 77 days and 86 days in two subsequent years, and this information is similar to other reports (Tuttle and Carroll 1997). Wood turtles reach sexual maturity in 12-20 years (Harding 1997).

Ecology: Wood turtles are more terrestrial in their habits than other aquatic turtles in the upper Midwest, and studies have shown that wood turtles occupy terrestrial habitats in up to 40% of annual observations (Ernst et al. 1994, Harding 1997, Arvisais et al. 2004). Wood turtles are fairly mobile, and will travel an average of 27-115 m (89-377 ft) per move during the non-nesting season (Arvisais et al. 2002). Buech (1995) observed wood turtles in northeastern Minnesota to start basking when the air temperature exceeds stream temperature and begin the more extensive terrestrial part of their year from mid-June to mid-August. A relationship between temperature and stream affinity was observed in a Pennsylvania study where Kaufmann (1992) observed turtles to spend more time in and near streams when air temperatures fell below 68° F. Wood turtles have been observed to travel broad distances during the summer ranging from 4-933 m (13-3061 ft; Kaufmann 1992, Compton et al. 2002, Tuttle and Carroll 2003, Remsberg et al. 2006, as reviewed by Natural Heritage and Endangered Species Program 2007, Jones 2009, Parren 2013). Wilder (unpublished) observed 95% of a turtle population studied in the Wisconsin central sand plains to travel up to 300 m (984 ft) from stream edge. A study in Ontario observed 27% of radio-tracked turtles, mostly female, located between 300-500 m (984-1640 ft) from water (Ontario Wood Turtle Recovery Team 2010). In early spring and late fall, in a Virginia study, wood turtles were observed to remain relatively close to water traveling no further than 60 m (197 ft) from stream edge in one study site and 97% of turtles traveling within 60 m from stream edge in another site (Sweeten 2008).

Reports of average home range sizes vary considerably from < 2.5 acres to > 74.1 acres (reviewed by Arvisais et al. 2002, Remsberg et al. 2006). Arvisais et al. (2002) suggests that home range size increases with increasing study-location latitude, but other studies suggest that large home ranges may indicate poor quality habitat or drought (Remsberg et al. 2006). Similar to habitat selection, a substantial amount of variability has been reported in the size of home ranges among study locations and among individual turtles. Wood turtles tend to return to the same locations within their home ranges (Arvisais et al. 2002, Walde et al. 2007, Parren 2013).

Adult wood turtles typically overwinter at the bottom of flowing streams that possess high oxygen content and do not freeze (Ernst 1986, Graham and Forsberg 1991). Overwintering wood turtles rest near structures such as underwater logs and snags and exposed along streambeds (Graham and Forsberg 1991, Greaves and Litzgus 2007, Greaves and Litzgus 2008). The water depth at which this species overwinters varies geographically, and ranges from 0.3-2.3 m (1.0-7.5 ft) among sites in Massachusetts, Pennsylvania and Ontario (Ernst 1986, Graham and Forsberg 1991, Greaves and Litzgus 2007, Greaves and Litzgus 2008). Wood turtles in Wisconsin have a maximum active period of March 15 – October 31.



Natural Community Associations (WDNR 2005, WDNR 2009):

Significant: [alder thicket](#), [bracken grassland](#), [coldwater streams](#), [coolwater streams](#), [dry prairie](#), [floodplain forest](#), [Great Lakes barrens](#), [northern mesic forest](#), [oak barrens](#), [pine barrens](#), [sand prairie](#), [shrub carr](#), [submergent aquatic \(submergent marsh\)](#), [warmwater rivers](#), [warmwater streams](#).

Moderate: dry-mesic prairie, ephemeral pond, northern hardwood swamp, northern sedge meadow, northern wet forest, northern wet-mesic forest, oak opening, oak woodland, southern hardwood swamp, southern mesic forest, southern sedge meadow, wet prairie.

Minimal: inland lakes, impoundments/reservoirs.

Habitat: Wood turtles prefer moderate- to fast-flowing, clear streams or rivers associated with forested riparian corridors (Vogt 1981, Arvisais et al. 2004). Typically these waterways possess a sand, gravel, or cobble substrate with limited silt or muck (Harding 1997). Wood turtles are occasionally found in ponds, swamps, wet meadows, and lakes (Arvisais et al. 2004).

Wood turtles are known to use a variety of habitats ranging from closed-canopy forests to much more open areas during their active period, and they can move very long distances away from their overwintering streams. Wood turtles often select “edges” within preferred terrestrial habitats, such as the edge of wooded riparian corridors near open water, wooded upland habitats adjacent to open meadows and fens, or forest openings (Kaufmann 1992, Compton et al. 2002, Arvisais et al. 2004). They also select low-growing alder stands and alder swales associated with rivers or stream banks (Quinn and Tate 1991, Kaufmann 1992, Arvisais et al. 2004). Despite wood turtles’ relationship with woodland communities, they typically prefer low to moderate canopy cover at the microhabitat scale (Compton et al. 2002, Arvisais et al. 2004).



Left photo: River where wood turtles have been documented in northern Wisconsin. Ryan Magana, Wisconsin DNR. Right two photos: Wood turtle habitat with river and adjacent sandy bank used for nesting. Richard Staffen, Wisconsin DNR

Wood turtle nesting occurs in well-drained open or sparsely vegetated sandy soils, typically within 61 m (200 ft) of suitable aquatic habitat. Nesting habitats include native dry prairies, moderately sloughing sand banks, agricultural fields, or areas of disturbed sandy soils that support no or sparse ground layer vegetation.

Little is known about the habitat selection of hatchling wood turtles. Existing information indicates that hatchlings begin migrating to water immediately after they emerge from the nest, but individuals vary in how quickly they complete this migration (Tuttle and Carroll 2005). Hatchlings during this time typically excavate and rest in “forms,” or small shelters, that often retain the shape of the turtle’s shell after it leaves. Forms have been observed in a variety of habitats, such as beneath the basal leaves of plants, mushrooms, and within holes or moss under over-hanging banks (Tuttle and Carroll 2005). After hatchling turtles reach water, they likely spend the majority of their time over the next several years within a few meters of the shoreline (Brewster, unpublished data).

Threats: The wood turtle is uncommon to rare throughout its range, and many populations have declined significantly (Harding and Bloomer 1979, Walde et al. 2003, Daigle and Jutras 2005). Primary causes of population declines include habitat loss and excessive collection by biological supply companies for the pet trade, combined with low recruitment and population sensitivity to adult removal (Harding and Bloomer 1979, Ernst 2001). Populations of long-lived, slow-to-mature species such as wood turtles cannot withstand more than their naturally very low mortality rates (Congdon et al. 1993). Wood turtle populations are particularly sensitive to removal of reproducing adults, and Compton (1999) determined that removal of only two adults annually from a group of 100 individuals would result in extinction of that population in 76 years, and removal of three adult individuals annually would lead to extinction in 50 years.

Road mortality continues to play a significant role in wood turtle declines. Nesting females are often killed on roads as they migrate to and from nesting locations. As natural or artificial open sandy sites become overgrown or planted (often because these areas are not recognized as turtle nesting sites), turtles are being forced to use bridge crossings that increase the likelihood of road mortality (Thayer et al. 2008). Nest predation rates at bridge crossings appear to be near 100%, presumably because nesting is confined to road edges that are small and linear (Steen et al. 2006, T. Thayer pers. comm.). Recent studies show that turtle populations near roads, including wood turtle populations, have male-skewed sex ratios (Steen et al. 2006), which may influence population viability.

Agricultural practices have also been found to have a significant impact on wood turtles, through both habitat destruction and direct mortality (Saumure and Bider 1998, Saumure et al. 2007, Jones 2009, as reviewed by Parren 2013, R. Thiel pers. comm., T. Thayer pers. obs.).

Climate Change Impacts: The effects of climate change are unclear for the wood turtle. Anticipated changes in storm frequency and intensity peak water levels, and other waterway characteristics may threaten the available habitat requirements for basking, cover, food availability, and hibernacula of the wood turtle (WICCI 2011). A potentially longer growing season for agriculture communities may also lead to an increase in adult mortality; putting more negative pressure on population viability (WICCI 2011).

Survey Guidelines: Persons handling wood turtles must possess a valid [Endangered and Threatened Species Permit](#). Conclusive determination of presence or absence of wood turtles is very difficult because of their ability to travel large distances in short time period. In addition, they can be difficult to locate in certain habitats, even by trained biologists with radio-telemetry equipment (Cochran et al. 2014, Saumure et al. 2007). Therefore, these guidelines are provided only as general survey guidelines and are generally not suitable for regulatory purposes. If surveys are planned for regulatory purposes, survey protocols and surveyor qualifications must first be approved by the Endangered Resources Review Program (see *Contact Information*).

The primary method for detecting this species involves visual encounter surveys (VES) in and adjacent to rivers and streams that support suitable wood turtle habitat (see “Habitat” section). Visual encounter surveys focus on basking turtles along the banks of water bodies possessing suitable aquatic and terrestrial habitat. These surveys can either be conducted on-foot (if access by landowner is granted) or from a canoe. Surveys must be conducted from April through early June on sunny days when temperatures are 50-80° F (Saumure and Bider 1998, Arvisais et al. 2002, Remsberg et al. 2006). Wood turtles can travel long distances from their over-

wintering streams, and observations can become particularly difficult in early to mid-June as turtles move further from the water and herbaceous terrestrial vegetation becomes tall and limits observations on the ground (E. Epstein pers. comm., R. Hay pers. obs.). Arvisais et al. (2002) sampled this species effectively in Canada by implementing a four to five person surveying strategy. This included three people walking abreast in terrestrial habitats, out to roughly 10 m from the stream banks, with one or two surveyors canoeing or walking through adjacent aquatic habitat in coordination with terrestrial surveyors. Canoeing/kayaking can improve the efficiency of detecting and surveying suitable habitats, and may allow basking observations on downed trees in the water. Wood turtles' use of downed trees over water for basking appears to vary considerably; they do so commonly in some rivers in northern Michigan (J. Harding pers. comm.), but only occasionally in Wisconsin. Log basking, where wood turtles bask on logs over deeper pools in the river, appears to increase in fall when turtles are back at the water prior to overwintering (R. Hay pers. obs.). Wood turtles often cannot be effectively trapped, negating one of the traditional detection methods for most aquatic turtles.

Surveys for nesting females can also be conducted using VES in suitable wood turtle nesting habitat (see "Habitat" section), but cannot be used to determine species' presence/absence. Nesting surveys should occur from late-May through mid-June at any time of day (Walde et al. 2007). Nesting typically does not occur in the rain, but has been documented to take place after a rain, making this an ideal time to search for nesting females (Ernst & Lovich 2009). Gravid females are often found resting at the base of small to moderate-sized patches of woody vegetation, such as thickets and clumps of willow or alder.

Summarize results, including survey dates, times, weather conditions, number of detections, detection locations, and behavioral data and submit via the WDNR online report: <<http://dnr.wi.gov>, keyword "rare animal field report form">

Management Guidelines

The following guidelines typically describe actions that will help maintain or enhance habitat for the species. These actions are not mandatory unless required by a permit, authorization or approval.

This section provides guidance for maintaining, restoring and enhancing habitat for the wood turtle.

Wood turtle habitat often includes a mosaic of various wetland types (wet meadows/shrub-carr and lowland hardwoods) and adjacent forested and semi-forested uplands. Management that maintains a balance of structural diversity (open grasses/sedges, shrubs such as alder and willow, and forest) will provide the appropriate habitat for wood turtles. If shoreline clearing must occur, brush should only be cleared along one side of a stream and preferably in small segments. Maintaining tussock sedges (*Carex stricta*) is also important because it provides a mosaic of open basking structure and cover. In contrast, reed canary grass (*Phalaris arundinacea*) is particularly problematic for wood turtles, especially for hatchlings/juveniles, because the high stem densities impede movement in riparian habitat. Reed canary grass can quickly proliferate after a timber harvest, sometimes to the point of inhibiting tree regeneration, so carefully consider the risks when conducting timber harvest in places where it is present. The tall canopy of this grass also inhibits wood turtle basking beyond early June.

The loss of suitable nesting habitat is one of the most serious threats to wood turtle populations in Wisconsin. Many communal nesting sites have been lost in recent decades to natural succession, tree plantings, or the conversion of open habitat for development (e.g., boat launches, paved parking areas, houses). Riparian habitat should be managed to create small grass openings, mixed grass-shrub, mature speckled alder and willow stands, young age classes, and early succession vegetation types (Buech 1995). Significant management is needed to restore and create nesting habitat away from roadways. Spotted Knapweed (*Centaurea stoebe*), which is an exceedingly noxious and invasive weed in sandy soils, appears to render soils unsuitable for turtle nesting and should be removed (R. Hay pers. obs.). Transportation corridors also may inadvertently provide ideal nesting habitat for females. Management around transportation corridors near riverine habitat should include providing tree shade and dense ground vegetation on the banks and shoulders of roads to discourage nesting females (Buech 1995).

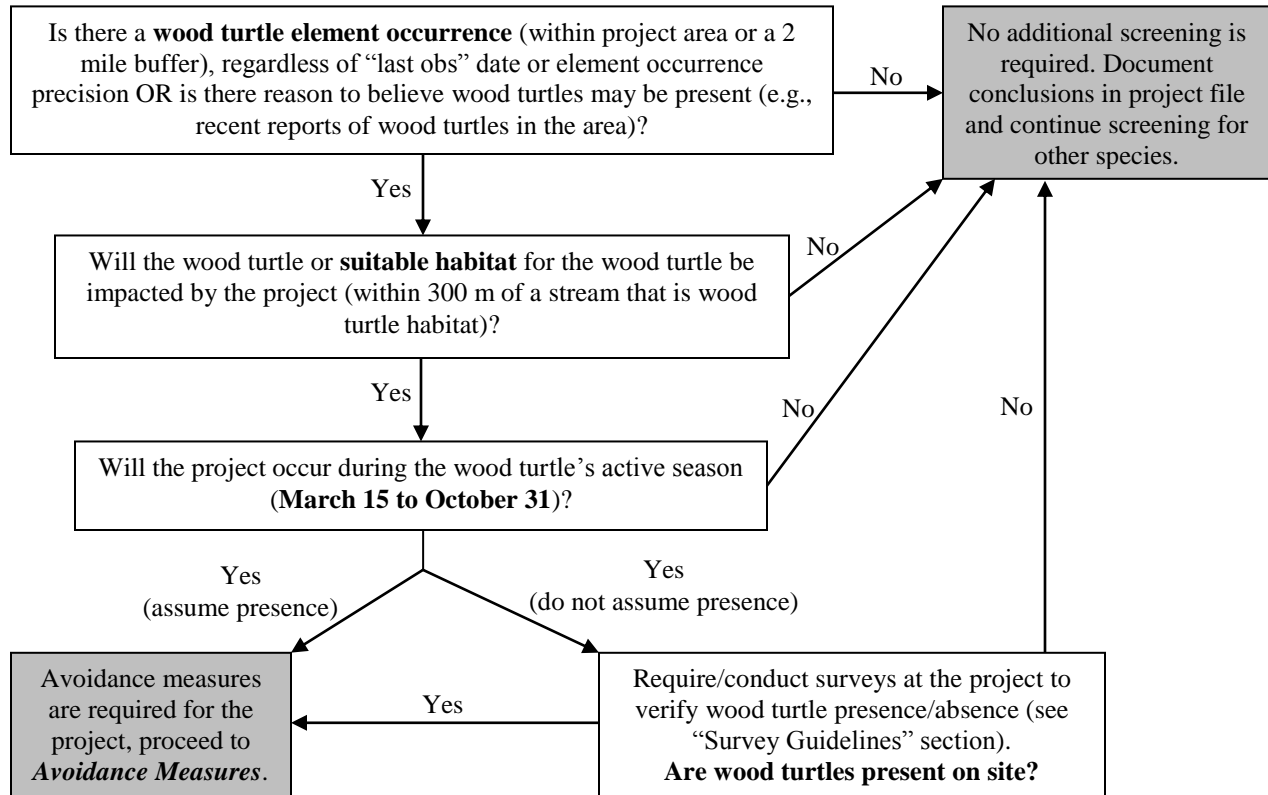
When logging within wood turtle habitat, selective cutting is preferred over clear-cutting. Timber harvests should follow appropriate avoidance measures for this species (see *Avoidance Measures*). Forestry practices that help to maintain sandy openings (i.e., nesting areas) can greatly benefit this species. For any cultivation of land for agricultural or other purposes near wood turtle habitat it is recommended to raise the blade height for mowing to a minimum 150 mm and use sickle bar mowers over rotary mowers to reduce wood turtle mortality (as reviewed by Parren 2013).

Road mortality is a major threat to wood turtle populations (Steen et al. 2006), but turtle barriers reduce this impact (Christoffel and Hay 1994). Barriers, when funneled toward and connected to bridges, allow turtles to freely move up and down streams. Permanent barriers should be installed where proposed road projects cross rivers or streams occupied by wood turtles.

Screening Procedures

The following procedures must be followed by DNR staff reviewing proposed projects for potential impacts to this species.

Follow the “Conducting Endangered Resources Reviews: A Step-by-Step Guide for Wisconsin DNR Staff” document (summarized below) to determine if wood turtles will be impacted by a project (WDNR 2012):



Avoidance Measures

The following measures are specific actions typically required by DNR to avoid take (mortality) of state endangered or threatened species per Wisconsin’s Endangered Species Law (s. 29.604, Wis. Stats.). These guidelines are typically not mandatory for non-listed species (e.g., special concern species) unless required by a permit, authorization or approval (e.g., forest certification).

According to Wisconsin’s Endangered Species Law (s. 29.604, Wis. Stats.), it is illegal to take, transport, possess, process, or sell any wild animal on the Wisconsin Endangered and Threatened Species List (ch. NR 27, Wis. Admin. Code). Take of an animal is defined as shooting, shooting at, pursuing, hunting, catching, or killing.

If *Screening Procedures* above indicate that avoidance measures are required for a project, please follow the measures below. If you have not yet read through *Screening Procedures*, please review them first to determine if avoidance measures are necessary for the project.

1. The simplest and preferred method to avoid take of wood turtles is to avoid directly impacting individuals, known wood turtle locations, or areas of suitable habitat (described above in the “Habitat” section and in *Screening Procedures*).
2. If impacts cannot be avoided during grassland and/or savanna restoration or management activities, but the Grassland and Savanna Protocols can be followed (<http://dnr.wi.gov/topic/ERReview/Documents/GspWoodTurtle2011.pdf>), the project is

covered for any unintentional take that may occur.

3. If suitable habitat cannot be avoided for other projects, the following time-of-year restrictions can be used to avoid take (streams must be avoided at all times):

Distance from stream edge	Time period when avoidance of ground disturbing activities or access with motorized vehicles is required
0 m-75 m (0 ft -246 ft)	March 15-October 31
75 m-300 m (246 ft-984 ft)	May 15–September. 15

- Install exclusion fencing according to the [Amphibian and Reptile Exclusion Fencing Protocols](#) around the work area during periods of inactivity. Work can then be conducted within the fenced area at any time of year as long as the fencing is maintained.
4. If wood turtle impacts cannot be avoided, please contact the Natural Heritage Conservation Incidental Take Coordinator (see *Contact Information*) to discuss possible project-specific avoidance measures. If take cannot be avoided, an [Incidental Take Permit or Authorization](#) is necessary.

Additional Information

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Linked Websites

- Amphibian and reptile exclusion fencing protocols: <<http://dnr.wi.gov>, key word "exclusion fencing">
- Endangered and Threatened Species Permit: <<http://dnr.wi.gov>, key word "endangered species permit">
- Incidental Take Permit and Authorization: <<http://dnr.wi.gov>, key word "incidental take overview">

- Natural Communities of Wisconsin: <<http://dnr.wi.gov>, key word “natural communities”>
- Rare Animal Field Report Form: <<http://dnr.wi.gov>, key word “rare animal field report form”>
- Wisconsin Endangered and Threatened Species: <<http://dnr.wi.gov>, key word “endangered resources”>
- Wisconsin Endangered and Threatened Species Permit: <<http://dnr.wi.gov>, key word “endangered species permit”>
- Wisconsin Initiative on Climate Change Impacts: <<http://www.wicci.wisc.edu/>>
- Wisconsin Natural Heritage Working List: <<http://dnr.wi.gov>, key word “Natural Heritage Working List”>
- Wisconsin’s Wildlife Action Plan: <<http://dnr.wi.gov>, key word “Wildlife Action Plan”>

Funding

- USFWS State Wildlife Grants Program: <<http://wsfrprograms.fws.gov/subpages/grantprograms/swg/swg.htm>>
- Sadie Nolan Amphibian and Reptile Education and Conservation Memorial Fund
- Wisconsin Natural Heritage Conservation Fund

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